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Version 1

Quick Guide
Minimum Disinfection for Groundwater

Colorado Department of Public Health and Environment

PROVIDED TO PUBLIC WATER SYSTEMS FROM THE COMPLIANCE ASSURANCE SECTION OF THE WATER QUALITY CONTROL DIVISION

Purpose

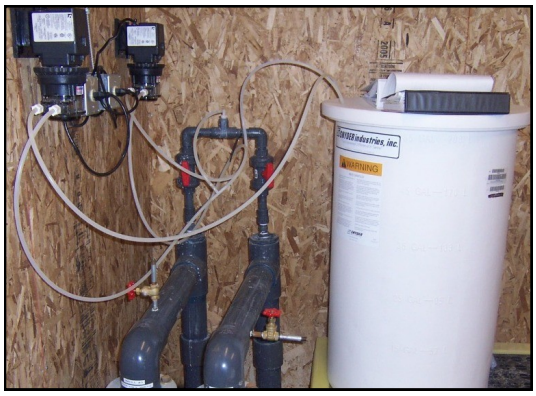
Disinfection of drinking water is one of the major public health advances in the 20th century. One hundred years ago, typhoid and cholera epidemics were common throughout American cities. Disinfection was a major factor in reducing these epidemics.

Once drinking water is disinfected to meet public health standards, the residual disinfectant level in the distribution system must be maintained as a final barrier in protecting against disease outbreak. Maintaining this residual disinfectant prevents bacterial re-growth and protects against the intrusion of microbial contamination (viruses, bacteria, parasites, etc.), especially in the unfortunate event of a pipe break or backflow event.

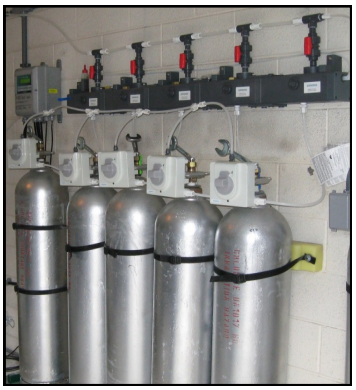
Even under normal conditions, residual disinfectants degrade based on demand and water age. Operators must manage disinfectant levels on a frequent and ongoing basis to protect consumers.

Common Reasons for Noncompliance

- Failing to measure a distribution system residual disinfectant with each total coliform sample (including repeats).
- Sampler forgets to write the residual down on the total coliform lab slip.
- Failing to maintain a minimum residual disinfectant at the entry point and in the distribution system.
- Entry point monitoring equipment failure.



Chlorine injection system. Photo by Paul Kim.



Gas chlorine cylinders. Photo by Serenity Valdez.

Overview of the Groundwater Disinfection Residual Requirements for Colorado Public Water Systems

Colorado Primary Drinking Water Regulations Article 13

- Applicability: All public water systems must chemically disinfect.
- All systems must maintain a detectable residual disinfectant in the distribution system. This must be measured at the same time and place as total coliforms are sampled. (See reverse for more details.)
- The risk for disease outbreaks increases when treatment is not adequate. Therefore systems must maintain 0.2 mg/L residual disinfectant at the entry point to the distribution system. (See reverse for more details.)
- Some systems may also be required to maintain a system specific residual disinfectant, that may be greater than 0.2 mg/L, in order to provide at least 4 Log treatment of viruses as required by 13.4 of the *Colorado Primary Drinking Water Regulations*.

EPA Guidance Documents

- *Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual* (EPA 815-R-99-015) August 1999
- *Alternative Disinfectants and Oxidants Guidance Manual* (EPA 815-R-99-014) April 1999
- *Ground Water Rule Compliance Monitoring: A Quick Reference Guide* (EPA-815-F-08-008) July 2008

Questions?

Contact the Water Quality Control Division:

303-692-3541 or
Cdphe.drinkingwater@state.co.us

Ask for your Groundwater Compliance Team.

TIPS

Sampling and Compliance Tips

DISTRIBUTION SYSTEMS

Measure the distribution system residual disinfectant at the same time and place as total coliform bacteria samples (including any repeat total coliform samples).

Use a field test kit that is designed to comply with approved analytical methods for distribution system monitoring. A list of approved methods can be found in Article 10.

Make sure the sampler knows how to follow the method and how to maintain the accuracy of the field test kit. Check with the manufacturer if you are not sure how to do this.

Detectable is considered at or above the detection limit of the method. For example, the DPD colorimetric method (Standard Method 4500-Cl G) cannot reliably measure residual below 0.05 mg/L. Any sample result that measures below the detection limit of the method should be reported as non-detect.

For compliance monitoring purposes, systems using chlorine should measure **free chlorine** as the residual disinfectant. Systems using chloramines should report **total or combined chlorine** as the residual.

To protect public health, systems are allowed to temporarily increase disinfectant residual, beyond the maximum residual disinfectant level (MRDL), to address a specific microbiological contamination problem.

The Water Quality Control Division expects wholesalers to cooperate with consecutive water systems to ensure their compliance, but each water system is ultimately responsible for its own compliance.

ENTRY POINTS

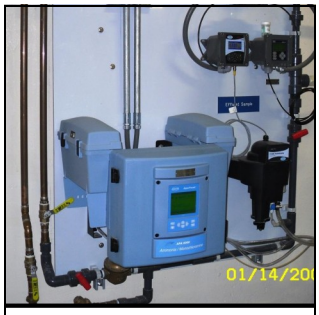
Entry-point residual disinfectant (EPRD) should be taken after required contact time but before the first customer. If a sample tap is not available prior to the first customer, systems may sample at the first customer.

If a system's entry point is at a storage tank effluent, the system must monitor its EPRD at least weekly even if the well or treatment plant is not producing water at the time.

Distribution System Requirements

- Maintain a detectable residual disinfectant in all locations in the distribution system. Detectable is considered at or above the detection limit of the method. For example, the DPD colorimetric method (Standard Method 4500-Cl G) cannot reliably measure residual below 0.05 mg/L.
- If a public water system fails to have a detectable residual disinfectant in more than 5 percent of samples per monitoring period, for two consecutive monitoring periods, this is considered a treatment technique violation and will require tier 2 public notification.
- Do not exceed 4.0 mg/L on a running annual average. Exceeding this level is considered a violation for community and non-transient water systems and will require public notification.

Entry Point Requirements



In-line chloramine analyzer. Photo by Serenity Valdez.

- Continuously chemically disinfect all sources whenever in use.
- Maintain at least 0.2 mg/L residual disinfectant at the entry point to the distribution system.
- Measure the entry point residual disinfectant at least once in every week that water is served from the groundwater source.
- If the entry point residual disinfectant falls below 0.2 mg/L, the system must continue to sample the entry point residual disinfectant at least every 24 hours until the residual has been restored.
- If the entry point residual disinfectant is not restored to at least 0.2 mg/L within 72 hours of discovery a treatment technique violation has occurred. Call the Water Quality Control Division as soon as possible but no later than the next business day after the violation occurred.
- When calling, make sure to know (1) when the disinfectant level dropped below 0.2 mg/L, (2) how long it was below 0.2mg/L, and (3) what was the lowest disinfectant level. According to rounding rules, 0.15 mg/L is not below 0.2 mg/L, but 0.14 mg/L is.
- When a treatment technique violation occurs the system must notify the Water Quality Control Division, provide Tier 2 public notification, document the situation including the date, time, duration of the failure, steps taken to correct the failure and steps taken to prevent future failures.

Reporting Made Simple

Distribution System Reporting

Systems must report a field residual measurement to the lab **with each total coliform sample**. All labs certified for total coliform analysis report the field residual measurement to the state with each total coliform sample result. Only water systems taking 40 or more total coliform samples per month may report summarized data using the **revised** Form 1- Routine Safe Data reporting form.

Groundwater System Entry Point Reporting

Systems should use the appropriate Monthly Operating Report Form and report to the Water quality Control Division within 24 hours of a treatment technique violation being identified. Systems should contact the appropriate Compliance Team to report treatment technique violations.

ALL laboratory and system reporting forms can be found at: http://www.cdphe.state.co.us/wq/drinkingwater/FormsAndTemplates.html.